

Event by Event Analysis in STAR

I. Sakrejda, F.Q. Wang and the STAR Collaboration

Early predictions for development of RHIC collisions and forecasted high multiplicity of RHIC events (Table 1.) make measurement of physics observables for individual events both interesting and statistically significant[1]. Event-by event analysis has a two-fold meaning. First of all, physics observables are calculated event by event. Some of them have to be estimated for individual events (like event anisotropy, and jets). Already this information can be related to the event dynamics [2]. Other observables were used before in inclusive analyses and now high event multiplicity makes it possible to evaluate them for each event separately. Both kinds of observables are used to characterize events (create “event spectra”). The next step of analysis consists of search for non-statistical fluctuations in “event spectra”. Possibly only a small fraction of the event population selected with the same global parameter (like centrality), will manifest such anomalous fluctuations [3].

The capability of STAR to provide event by event analysis of the RHIC collisions (e.g. Fig.1) was advertised as one of the most important features of the detector. Statistical methods for correlations analysis are being developed[4] to allow for a more quantitative approach and prepare the experiment to accomplish its goal.

Particle	# per event	# in acceptance
proton	180	60
π^-, π^+, π^0	1500	800
K^+, K^-	280	160
K_S^0, K_L^0	290	150
baryons	370	150

Table 1: Flavour composition of a 100 GeV/nucleon AuAu event.

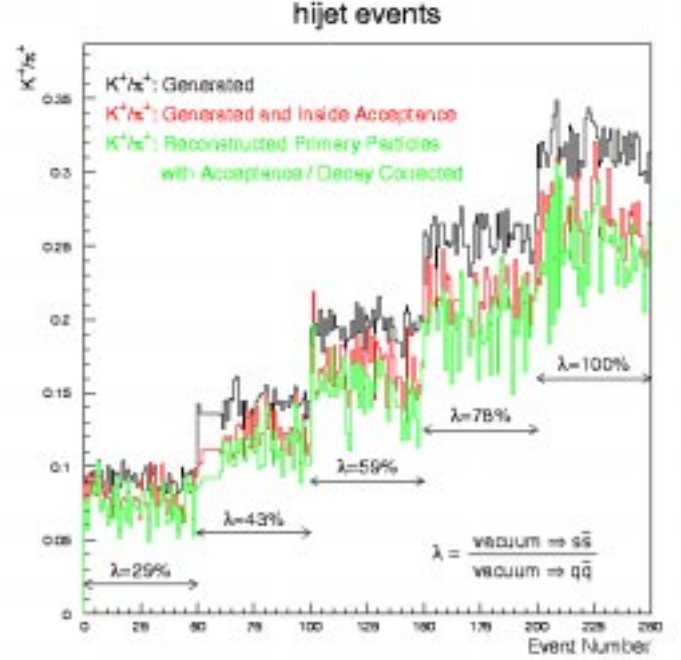


Figure 1: K/π resolution for central AuAu events

References

- [1] R. Stock, Analysis of Single Events in Ultrarelativistic Nuclear Collisions, Proceedings of Physics with the Collider Detectors at RHIC and the LHC, QM95.
- [2] Directed and Elliptic Flow in 158 GeV/nucleon Pb + Pb Collisions, H. Appelshuser et al.
- [3] Event-per-event analysis of heavy ion collisions and thermodynamical fluctuations, V.E. Shuryak, hep-ph/9704456.
- [4] STAR Trigger simulations, T.A. Trainor, <http://www.rhic.bnl.gov/star/starlib/doc/www/html/trg1/soft1/level2/l2intro.ps>